

**REMARKS**

**I. Introduction**

These amendments and remarks are being filed in response to the Office Action dated February 4, 2008. Claims 1-43 are pending in this application. For the following reasons this application should be allowed and the case passed to issue.

Applicants thank Examiner Asha J. Hall and Supervisory Examiner Alexa D. Neckel for meeting with Applicant's representative to discuss the instant application and for noting the lack of disclosure in Kamada et al., U.S. 2003/0034101 of all of the elements of claim 1.

**II. Claim Rejections 35 U.S.C. § 102**

Claims 1-10 were rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by Kamada et al., U.S. 2003/0034101. Applicants respectfully disagree.

Claim 1 recites,

“A thermoelectric conversion material comprising a half-Heusler alloy represented by the formula  $QR(L_{1-p}Z_p)$ , where Q is at least one element selected from group 5 elements, R is at least one element selected from cobalt, rhodium, and iridium, L is at least one element selected from tin and germanium, Z is at least one element selected from indium and antimony, and p is a numerical value that is equal to or greater than 0 and less than 0.5.”

Anticipation under 35 U.S.C. § 102 requires that “each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.” *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ 2d 1051, 1053 (Fed Cir. 1987). At a minimum, the cited prior art does not disclose (expressly or inherently) the above recited claims elements.

As an initial matter, the subject matter as defined in claim 1, is directed to a thermoelectric conversion material. As explained in the specification, at page 1, lines 9-14, a

thermoelectric conversion material “converts thermal energy and electric energy from one into the other by a thermoelectric effect.”

Furthermore, as recited in claim 1 the atomic ratio of the three elements Q, R and L is 1:1:1.

In contrast, Kamada discloses a low-alloy heat resistant steel for “high temperature turbine rotor members for use in steam turbine plant for thermoelectric power generation.” As such, Kamada does not teach a thermoelectric **conversion** material that **converts** thermal energy and electric energy from one into the other by a thermoelectric effect as recited in claim 1.

Moreover, Kamada does not recite a thermoelectric conversion material comprising a half-Heusler alloy represented by the formula  $QR(L_{1-p}Z_p)$ . Kamada teaches low-alloy steel with trace amounts of elements such as carbon (0.20 to 0.35%) and silicon (0.0005 to 0.35%). See paragraphs 31-46. Kamada also does not teach a material in which atomic ratio of the three elements Q, R and L is 1:1:1.

Therefore, Kamada fails to anticipate claim 1.

Accordingly, it is respectfully submitted that claim 1 is allowable.

Furthermore, claims 2-17 depend from and further define the subject matter of claim 1 and therefore are also allowable.

### **III. Claim Rejections – 35 U.S.C. § 103(a)**

#### **A. Kamada in view of Hampl**

Claim 11 was rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Kamada in view of Hampl et al., U.S. 3,873,370. Applicants respectfully disagree.

As discussed above, in reference to claim 1, Kamada fails to disclose all elements of the claims. In particular, at a minimum, Kamada fails to disclose a thermoelectric conversion material comprising a half-Heusler alloy represented by the formula  $QR(L_{1-p}Z_p)$ .

In order to establish a *prima facie* obviousness rejection under 35 U.S.C. § 103(a), basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Moreover, the teaching or suggestion to make the claimed combination and the reasonable expectation of success must not be based on applicant's disclosure. *In re Vaack*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Hampl fails to cure the deficiencies of Kamada. Hampl discloses a thermoelectric generator consisting of metal and nonmetal elements. At a minimum, Hampl does not disclose a thermoelectric conversion material comprising a half-Heusler alloy represented by the formula  $QR(L_{1-p}Z_p)$ .

Therefore, neither Kamada nor Hampl, either alone or in combination, teach all of the elements of claim 11.

Accordingly, it is respectfully submitted that claim 11 is allowable.

**B. Kamada in view of Kagawa**

Claims 12-17, 18-27, 29-39, 40, 42 and 43 were rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Kamada in view of Kagawa et al., U.S. 5,969,290. Applicants respectfully traverse this rejection because neither reference, either alone or combination, teach all of the elements of the claims.

As discussed above in reference to claim 1, at a minimum, Kamada fails to teach or suggest “a thermoelectric conversion material comprising a half-Heusler alloy represented by the formula  $QR(L_{1-p}Z_p)$ .”

Independent base claims 18 and 31 require similar claim elements as claim 1. More specifically, claims 18 and 31 recite, in pertinent part that:

“the thermoelectric conversion material comprises a half-Heusler alloy represented by the formula  $QR(L_{\text{sub.1-p}}Z_{\text{sub.p}})$ , where Q is at least one element selected from group 5 elements, R is at least one element selected from cobalt, rhodium, and iridium, L is at least one element selected from tin and germanium, Z is at least one element selected from indium and antimony, and p is a numerical value that is equal to or greater than 0 and less than 0.5.”

In order to establish a *prima facie* obviousness rejection under 35 U.S.C. § 103(a), basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Moreover, the teaching or suggestion to make the claimed combination and the reasonable expectation of success must not be based on applicant’s disclosure. *In re Vaack*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Further, “rejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.” *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006).

As noted above, Kamada teaches a low-alloy steel with trace quantities of elements such as carbon and silicon. Kagawa teaches placing a thermoelectric powder material on an electrode plate.

However, neither Kagawa nor Kamada disclose or suggest “a thermoelectric conversion material comprising a half-Heusler alloy represented by the formula  $QR(L_{1-p}Z_p)$ , where Q is at

least one element selected from group 5 elements, R is at least one element selected from cobalt, rhodium, and iridium, L is at least one element selected from tin and germanium, Z is at least one element selected from indium and antimony, and p is a numerical value that is equal to or greater than 0 and less than 0.5.”

Moreover, it would not be obvious to a person having ordinary skill in the art to combine the low-alloy steel material used for turbine rotor members for use in steam turbine plants of Kamada with the thermoelectric powder material of Kagawa, because adding a thermoelectric powder material to a low-alloy steel used for a turbine rotor would have the undesired effect of introducing powder into the steam generated by the turbine.

Therefore, neither Kamada nor Kagawa, either alone or in combination, teach all of the elements of claims 1, 18 or 31.

Accordingly, Accordingly, it is respectfully submitted that claims 1, 18 and 31 are allowable.

**C. Kamada in view of Kagawa and Hampl**

Claims 28 and 41 were rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Kamada in view of Kagawa as applied to claims 18 and 31 respectively and further in view of Hampl.

As discussed above in reference to the combination of Kamada and Kagawa as applied to claims 18 and 31, neither reference, either alone or in combination teaches or suggests all of the elements of the claims.

Moreover, Hampl fails to ameliorate the deficiencies of Kamada and Kagawa as applied to claims 18 and 31. This is because, at a minimum, none of the cited prior art references teach a “thermoelectric conversion material comprising a half-Heusler alloy represented by the formula

$QR(L_{1-p}Z_p)$ , where Q is at least one element selected from group 5 elements, R is at least one element selected from cobalt, rhodium, and iridium, L is at least one element selected from tin and germanium, Z is at least one element selected from indium and antimony, and p is a numerical value that is equal to or greater than 0 and less than 0.5.”

Therefore, none of the cited prior art, either alone or in combination, teach all of the elements of claims 18 or 31.

Accordingly, Accordingly, it is respectfully submitted that claims 18 and 31 are allowable.

**IV. All dependent claims are allowable**

Dependent claims 12-17, 19-30 and 32-34 are allowable as they depend from and further define the subject matter recited in allowable independent claims 1, 18 and 31.

**V. Conclusion**

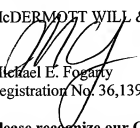
In view of the above amendments and remarks, Applicants respectfully submit that this application should be allowed and the case passed to issue. If there are any questions regarding this Amendment or the application in general, a telephone call to the undersigned would be appreciated to expedite the prosecution of the application.

**Application No.: 10/828,553**

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

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